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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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Punam Kumar Saha

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EXAMINER

AZARIAN, SEYED H

ART UNIT

PAPER NUMBER

2625

DATE MAILED: 05/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

## Office Action Summary

Application No.

09/779,032

Applicant(s)

SAHA ET AL.

Examiner

Seyed Azarian

Art Unit

2625

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

### Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

### Status

- 1) ☒ Responsive to communication(s) filed on 05 February 2004.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

### Disposition of Claims

- 4) ☒ Claim(s) 1-21 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-21 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 07 February 2001 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
  - ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

### Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date. \_\_\_\_\_
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: \_\_\_\_\_

### **RESPONSE TO AMENDMENT**

1. Applicant's arguments, filed 2/5/2004, see page 2 through 4, with respect to the rejection of claims 1-21 under 102(e) and 103(a) have been fully considered and are persuasive.

Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made in view of Guido Gerig et al (Nonlinear Anisotropic Filtering Of MRI Data) and Levene et al (U.S. patent 5,743,266).

### **Claim Rejections - 35 USC § 102**

2. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

3. Claims 1-13 and 15-21, are rejected under 35 U.S.C. 102(b) as being anticipated by Guido Gerig et al (Nonlinear Anisotropic Filtering Of MRI Data).

Regarding claim 1, Guido Gerig discloses method of post-acquisition processing an MRI-acquired image by variant anisotropic filtering to enhance structure and reduce noise (page 221, anisotropic diffusion filtering to improve and enhance image quality).

Regarding claim 2, Guido Gerig discloses the method, comprising improving a low signal-to-noise ratio, or improving a low contrast-to-noise ratio, or improving both (see abstract and page 221, improvement of acquisition parameters can be optimized regarding low signal-to-noise ratio SNR or contrast-to-noise ratio (CNR)).

Regarding claim 3, Guido Gerig discloses the method of claim 2, wherein comprising a spatial-resolution adaptive scale-computation method (page 221 through page 222, providing information through high-speed acquisition, or high spatial resolution or adaptive filtering which entails a tradeoff between smoothing efficiency).

Regarding claim 4, Guido Gerig discloses the method, comprising accurately using a restricted homogeneity parameter for filtering small scale regions of the image, and at the same time, using a generous filtering parameter for filtering large scale regions of the image (page 222, Fig. 1, generating at locations with gradient equal to parameter K or decreases below K, the flow reduces to zero because in homogeneous regions, and above K parameter the flow function decreases, halting diffusion at location of high gradients).

Regarding claim 5, Guido Gerig discloses the method of claim 4, wherein small scale regions comprise fine details and vicinities of boundaries of the image (Fig. 5, page 226, section A. the standard deviation of all the regions having a mean value falling within each intensity sub range, by selecting the window with smallest standard deviation show that the procedure allows homogeneous areas to be found efficiently).

Regarding claim 6, Guido Gerig discloses the method of claim 4, wherein interiors of homogeneous region of the image (Fig. 5, page 226, section A, see claim above and estimates of noise in background and tissue regions to be made. A region size of 8 x 8 the intensity range into 25 intervals allows relatively large region

Regarding claim 7 Guido Gerig discloses the method of claim 4, wherein filtering comprises a scale-based neighborhood averaging method (page 230, the weighting coefficients

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of a spatial averaging mask were the normalized gradient inverse between the center pixel and its neighbors).

Regarding claim 9, Guido Gerig discloses the method, wherein filtering comprises a scale-based diffusive filtering method (page 221, last paragraph developments based on anisotropic diffusion filtering overcome the major drawbacks of conventional spatial filtering and improve image quality).

Regarding claim 11, Guido Gerig discloses the method, wherein an enhanced MRI-acquired image is achieved for a selected MRI protocol, and for a selected region of a patient's body, and b) filtering the acquired image by a scale-based spatial resolution adaptive method using region-constancy based on local homogeneity to produce an enhanced image (see claim 4, and page 221, efficiently remove noise in region of homogeneous physical properties and enhance morphological definition by sharpening discontinuities based on anisotropic diffusion filtering).

Regarding claim 12, Guido Gerig discloses the method, wherein the image is enhanced independent of variations within or between patients, within or between tissues being imaged, or within or between MR devices used to acquire the image (page 226, section B. noise reduction efficiency and the ability to preserve image structures on a series of images of a form line fixed human brain).

Regarding claims 8 and 10, it recites similar limitation as claims 4 and 7, are similarly analyzed.

Regarding claims 13, and 15-21, it recites similar limitation as claims 11 and 12, are similarly analyzed.

### **Claim Rejections - 35 USC § 103**

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claim 14, is rejected under 35 U.S.C. 103(a) as being unpatentable over Guido Gerig et al (Nonlinear Anisotropic Filtering Of MRI Data) in view of Levene et al (U.S. patent 5,743,266).

Regarding claim 14, Guido Gerig fails to disclose “permitting production of enhanced real time images”. On the other hand in the same field of MRI Levene teaches (column 1, lines 7-11, processing a sequence of contrast-enhanced ultrasonic images and in particular sequence of diagnostic ultrasound images in real-time which are characterized by one or more parameters, also Fig. 4, column 8, lines 18-27).

Therefore it would have been obvious to one having ordinary skill in the art at the time of the invention was made, to modify Guido Gerig invention according to the teaching of Levene because it provides dynamic conditions which is noticeable only by viewing real-time video sequences that can easily be implemented in an image device such as magnetic resonance image or ultrasonic images.

*Other prior art cited*

6. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

U.S. patent (6,249,121) to Boskamp et al is cited for RF body coil.

U.S. patent (6,159,445) to Klaveness et al is cited for light imaging contrast agents.

U.S. patent (5,528,365) to Gonatas et al is cited for method and apparatus for imaging with diffuse light.

U.S. patent (5,644,646) to Du et al is cited for vessel enhancement filtering in magnetic resonance angiographies.

U.S. patent (6,556,720) to Avinash is cited for method and apparatus for enhancing and correcting digital images.

U.S. patent (5,991,701) to Triano is cited for method for improved instantaneous helical axis determination.

**Contact Information**

7. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Seyed Azarian whose telephone number is (703) 306-5907. The examiner can normally be reached on Monday through Thursday from 6:00 a.m. to 7:30 p.m.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh Mehta, can be reached at (703) 308-5246. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application information Retrieval (PAIR) system. Status information for published application may be obtained from either Private PAIR or Public PAIR.

Status information about the PAIR system, see [http:// pair-direct.uspto.gov](http://pair-direct.uspto.gov). Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Seyed Azarian

Patent Examiner

Group Art Unit 2625

April 29, 2004



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